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ABSTRACT

Cognitive categories in infants that have relevance for linguistic development were investigated. "Agent" and "recipient," the categories chosen, are relational categories which by definition involve action. This experiment explored infants' (48 males, 14-24 months of age) sensitivity to certain "action parameters" of events. The question of whether infants could perceive the difference between agents and recipients was operationalized by comparing infants' visual fixation times to different experimental events presented on two color, silent motion picture films. These events were constructed to be more or less discrepant from an additional standard event appropriate to the content of each film. The different experimental events in the two films were presented sequentially in the habituation paradigm. The agent-recipient dichotomy was contrasted by having real people and a table perform in filmed action sequences which represented three variations of the agent-recipient relationship. Data from the 48 subjects were analyzed in a four-factor analysis of variance using the difference scores between visual fixation time to the experimental event minus the visual fixation time to the preceding standard. The results indicated that only one agent-recipient reversal, the agent recipient reversal by direction, was watched more than the combined means of the agent-recipient reversal by position and the position-direction reversals. (DB)

Semantic Development in Infants: The Concepts of Agent and Recipient[1,2]

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Research in the area of first language acquisition has apparently established that infants can comprehend considerably more language than they can actually use themselves (Fraser, Bellugi, & Brown, 1963; Shipley, Smith, & Gleitman, 1969; Lovell & Dixon, 1967). However, Lenneberg (1971) and Bloom (1971) have argued that more often than not, infants are comprehending the nonlinguistic situational context which accompanies a statement rather than that statement's linguistic structures. By the time an infant begins to comprehend language, he has already formed many expectations about the relations among objects and events in the world. The child's perception and categorization of both linguistic and nonlinguistic events may have much to tell us about the process by which language is acquired. For example, Kaplan and Kaplan (1970) have suggested that the semantic or conceptual underpinnings of language acquisition may develop far in advance of the phonological and syntactic systems. The purpose of this investigation was to probe for cognitive categories in infants which have relevance for linguistic development.

"Agent" and "recipient," the categories chosen, were formulated by the linguists Chafe (1970) and Fillmore (1968) as part of their reaction to the cursory treatment given semantics in generative trans-

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[1]Presented at Society for Research in Child Development meetings, March 1973.

[2]This investigation is based on a dissertation submitted to Cornell University in partial fulfillment of the requirements for the Ph.D. degree.

formational grammar. These categories, as well as the other categories they offered, were defined by the role they played in the sentence. A variety of psycholinguistic investigations (e.g., Clark & Begun, 1971; Perfetti, 1972) have shown that the categories of agent and recipient are psychologically separable and can account for sentence processing in a way that linguistic categories such as "subject" and "object" cannot. In particular, a study by Suci and Hamacher (1972) has found that both adults and school-age children will answer questions about agents in both active and passive sentences faster than questions about recipients of the action; apparently agents receive processing priority.

Since the categories of agent and recipient are not directly expressed in any linguistic code, speakers' nonlinguistic knowledge of events in the world must be playing a crucial role in language processing. It has been suggested that there exists certain observable and inductible aspects of experience, probably universal, from which human beings construct these categories (Slobin, 1969). For example, all children have mommies and shelter and encounter animate and inanimate objects and the interactions that transpire between these objects. In fact, a number of independent observational studies of first language acquisition claim that relational semantic categories such as agent and recipient are present in the earliest utterances of children from widely differing cultures (Bloom, 1970; Brown, 1970; Kernan, 1970; Schlesinger, 1971; Slobin, 1969). For example, using the technique of "rich interpretation", Bloom noted that the utterance "Mommy sock" said while the child is having his sock put on him, may mean "mommy-the agent- is putting on my sock-the object." Both Bloom (1971) and Brown (1970) have asserted that semantic relations represent the linguistic encoding of previously

abstracted conceptual relations. Semantic relations may represent a type of terminal achievement of the sensorimotor period, with the cognitive counterparts for the linguistic categories present well before the production of the first two-word utterance.

Nonetheless, thus far few empirical studies have investigated whether young children perceive the world in terms of the semantic relations which they are presumably encoding linguistically. The present study was an attempt to assess whether minimally verbal infants function with the cognitive categories of agent and recipient in their perception of events. "Agent" and "recipient" are relational categories which by definition involve action. Therefore, this experiment explored infants' sensitivity to certain action parameters of events.

The question of whether infants could perceive the difference between agents and recipients was operationalized by comparing infants' visual fixation times to different experimental events presented on two, color, silent motion picture films. These events were constructed to be more or less discrepant from an additional standard event, appropriate to the content of each film. Thus, according to the "discrepancy hypothesis" (e.g., McCall & Kagan, 1967), differential habituation of visual fixation responses was predicted to be a function of the magnitude of discrepancy of an experimental event from the standard event. In addition, one film included a violation of the restrictions on the agentive class by having an inanimate object appear to be performing actions. Violation of expectancy notions (Charlesworth, 1969) predicted differential habituation to events that represented a violation of an existing category.

Visual fixation, or the amount of time an infant spends looking at a stimulus, was a response already in the infants' repertoire, which has considerable intuitive and empirical validity in the measurement of emerging cognitive structures (Lewis, 1970; McCall, 1971). The different experimental events in the two films were presented sequentially in the habituation paradigm. Thus, it was anticipated that visual fixation time would start out high at the beginning of the films and gradually decrease, but more to the repeated standards than to the experimental events.

More specifically, the agent-recipient dichotomy was contrasted by having real people and a table perform in filmed action sequences which represented three variations of the agent-recipient relationship. "Agent" was defined as the animate instigator of the transitive action of "pushing" while "recipient" was defined as the animate or inanimate object of the action of pushing. In two of these events, the agent-recipient relationship was reversed, that is, the agent of the action became the recipient and the former recipient became the agent. The third event was conceived of as a control event; it altered superficial, perceptual features of the event but did not change the agent-recipient relationship.

Figure 1 presents the three types of experimental events and the standard event in the boy-girl film. The standard event may be described as "boy pushes girl from the left to the right." In relation to this event, there are two ways in which a reversal of the agent-recipient relationship can occur. In the agent-recipient reversal by position, the boy and girl switch their positions on the screen and the girl

becomes the agent and the boy the recipient. The other way to create a reversal of the agent-recipient relationship, the agent-recipient reversal by direction, occurs when the direction of the action across the screen changes and the girl now pushes the boy. Thus, the transformation that occurred in these two events changed the meaning of the event by altering the agent-recipient relationship which held between the actors. The third experimental event, position-direction reversals changed the position of the characters and the direction of the action across the screen, but the boy is still pushing the girl. To draw the linguistic analogy, the two events which changed the agent-recipient relationship may be considered changes in the deep structure or meaning of the event while the third, control event may be considered a change in the surface structure or form of the event.

If infants do not know the difference between agents and recipients, the control event, position-direction reversals, would be considered maximally different from the standard event since it alters both superficial features of position and direction. This event should be watched more than the agent-recipient reversals. However, if the categories of agent and recipient do have psychological reality for infants, then the two events which represent reversals of the agent-recipient roles as portrayed in the standard event should be watched more than the position-direction reversals.

Figure 2 presents the three experimental events and the standard event as they appeared in the boy-table film. The events are constructed in the same way as in the boy-girl film except that in the boy-table film an anomaly is introduced when there is an agent-recipient reversal. That

is, it was made to look as though the table was pushing the boy. This film was included to uncover whether infant's category of agent was refined to the extent that it included only animate objects.

SHOW FILM

The subjects did not see this film. This film has portions of bot. films spliced together so you can see what the films looked like.

Subjects were all male and selected on the basis of their age and linguistic productions. The younger group, 14-18 months, was producing only single words while the older group was 20-24 months and producing word combinations. After an initial adaptation period, the subject's mother seated him in a highchair two and a half feet from a rear projection screen and he was given a pretzel stick. The value of this pretzel stick should not be underestimated. The lights were dimmed and the first film shown. A hidden observer using a Rustrak event recorder, and unaware of which events were on the screen, depressed the switch each time the baby watched the film. Each film had 6 blocks of trials such that the standard event appeared three times, before each of the experimental events. At the start of each new block of 6 trials a bell directly behind the screen was sounded so that the infant would know that a new event had come on. After a 10 minute intermission, the second film was shown. Each film took 4 minutes and 50 seconds.

The data from the 48 subjects were analyzed in a four-factor analysis of variance using the difference scores between visual fixation time to the experimental event minus the visual fixation time to the preceding standard. The factors were age, order of presentation of the events, film and type of event -- the latter two (film and event) were repeated measures.

If infants perceived agent-recipient reversals, this would be reflected in a main effect of type of event. Specifically, the two agent-recipient reversals in both films would be watched significantly more than the position-direction reversals. However, as seen in Figure 3, the results indicated that only <u>one</u> agent-recipient reversal, the agent-recipient reversal by direction, was watched more than the combined means of the agent-recipient reversal by position and the position-direction reversals. It should be stressed that the pick up of agent-recipient reversals that occurred in agent-recipient reversals by direction <u>cannot</u> be attributed solely to the presence of the direction change since the control event, position-direction reversals, contained a direction change. Apparently, agent-recipient reversals were perceived when cued by change in direction but not when cued by a change in position.

This finding is interpreted to mean that agent-recipient reversals can be perceived, at least when such a reversal is cued by a direction change. This lends support to the notion that the categories of agent and recipient have been constructed by minimally verbal infants. Upon closer examination, this conclusion cannot be offered with confidence due to the different response patterns to the two films. There is some question as to whether the boy and the girl were perceptually distinctive enough in the boy-girl film.

Finally, I would like to note the potential methodological ramifications of this research for the field of language acquisition and cognitive development. This study has used film to contrast action parameters and operationalize the cognitive counterparts of linguistic categories. We know now that infants as young as 14 months will watch films -- even ones for five minutes long that were as repetitive as these. Evidently, infants

can distinguish between filmed events along semantically defined action parameters. The use of film in the serial presentation habituation paradigm (or the paired comparison paradigm (McHale, 1972)) may permit psychologists to study the cognitive precursors of semantic categories and remove some of the mystery associated with the production of children's earliest utterances.

Figure 1

The Boy-Girl Film:
The Variation of the Three Experimental Events
in Relation to the Standard Event

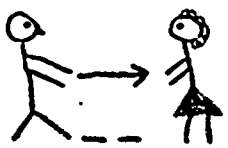
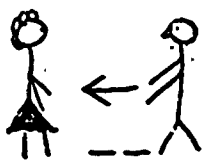
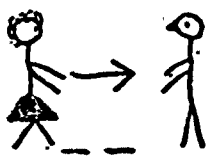
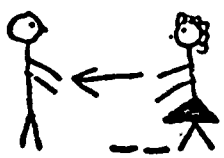
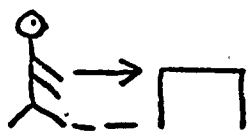
	Standard Event		
			
	Boy pushes girl from left to right		
Type of Reversal:	Position-Direction	Agent-Recipient by Position	Agent-Recipient by Direction
			
Description:	Boy pushes girl from right to left	Girl pushes boy from left to right	Girl pushes boy from right to left

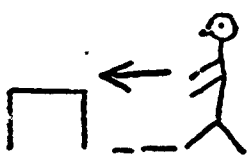
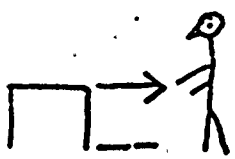
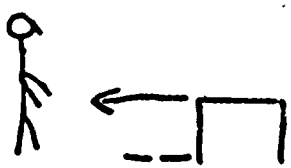
Figure 2

The Boy-Table Film:
The Variation of the Three Experimental Events
in Relation to the Standard Event

Standard Event



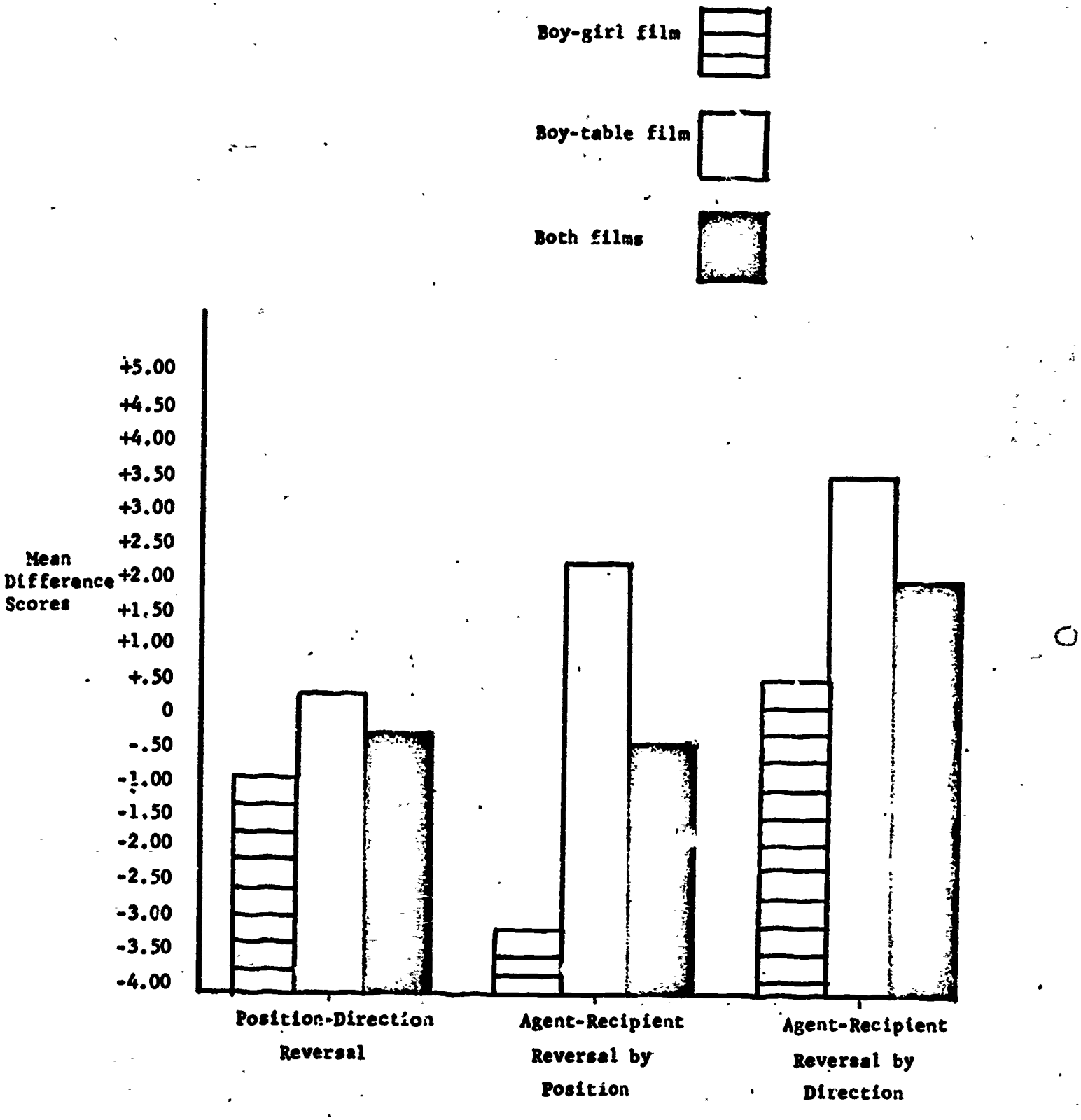
Boy pushes table from left to right

Type of Reversal:	Position-Direction	Agent-Recipient by Position*	Agent-Recipient by Direction*
			
Description:	Boy pushes table from right to left	Table pushes boy from left to right	Table pushes boy from right to left

* Anomalous events; violation of the agentive class

Figure 3

The Main Effect of Type of Experimental Event



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